

Efficacy of Dental Mesenchymalstem Cells in Kidney failure

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Abstract: Kidney is one of the most important organs in human body; it has various roles in maintenance of life. Any disturbance in composition of kidney may be lead to kidney diseases, so this is reflect on the function of kidney. There are different strategies in treatment of kidney disease. Although, these techniques have useful role in treatment process but also have numerous side effect which not only effect on kidney healthy buteffect on other organs. New trend in treatment process find the way of treatment with out or with few risk. Stem cells use in treatment of different diseases. There are 2 types of stem cells; embryonic stem cells, and adult stem cells;adult stem cells include bone marrow, and teeth stem cells. All researches indicate that stem cell originated from teeth has more efficiency as compared to other types of stem cells. Dental stem cell success in treatment many complicated diseases. In this article we will discuss function of kidney,kidney diseases, stem cells dental stem cells, and its role in treatment of kidney diseases.

Key words: Kidney, kidney failure, stem cell, dental stem cell.

INTRODUCTION

Kidney

Kidneys are the body's filtering units, which located in the direction of the back of the body, approximately 10 cm above the hipbones and below the ribcage. Kidney play a vital role in maintaining balance of fluid, minerals, salts and other substances in the blood. They are responsible for removing waste and toxic substances from the body through the urine. In addition to they produce numerous hormones as erythropoietin, which responsible for production of red blood cells; calcitriol, which increase the rate of absorption of calcium and play important role in bone mineralization; and renin, which is enzyme involved in controlling blood pressure **Fig.1.** [11].

Kidneys are consist from small units which called nephrons, any disturbance in these cells lead to uncontrolling of kidney functions, and development of many kidney diseases. Kidney diseases generally involve damage to the nephrons and can be acute or chronic [12]. In acute kidney disease there is a speedy drop in kidney function. This occurs by loss of large amounts of blood or an accident. While chronic kidney disease (CKD) is well-defined as loss of a third or more of kidney function for at least three months. The risk of developing CKD is increased by age, diabetes, high blood pressure, obesity and smoking. At least 8% of the people in Europesuffer from CKD, and these people have great risk for developing kidney failure. This risk is increasing every year and there are not enough volunteers to provide transplants for these patients. So most of researchers make all efforts to development of new therapeutic options for treating CKD [8].

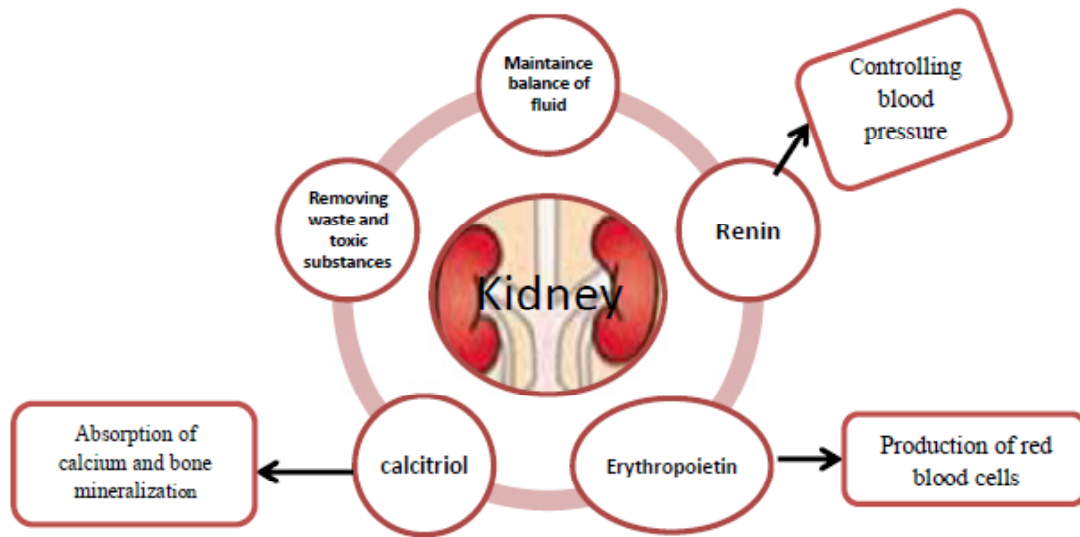


Fig1. Functions of kidney

The chief role of Kidneys is eliminating excess fluids from the blood through urine. Once kidneys start to fail, this function becomes disrupted. More fluids begin collecting in the body. Then, swelling starts. Some patients suffer from swollen eyes as well as swollen legs after that the entire body might swell up [9]. Various studies indicated that when kidney loses its function, it cannot secrete sufficient amount of erythropoietin, so erythropoietin does not stimulate the bone marrow to produce more red cells, finally anemia will happen [6].

Stem Cells

Stem cells are unique for the reason that they drive the natural healing process through your life. Stem cells are unlike other cells in the body since they regenerate and produce specialized cell types. They heal and restore skin, bones, cartilage, muscles, nerves and other tissues once injured. There are two main types of stem cells: adult stem cells, such as those found in bone marrow and teeth, and embryonic stem cells [3].

Nowadays, medical researchers are knowledgeable how to control stem cells and direct their growth into specialized cells, including: blood, skin, bone, cartilage, teeth, muscle and nerves. This leads to incredible new medical treatments for various difficult diseases including: Parkinson's disease, Brain Injuries, Heart Disease, Diabetes, Arthritis, Muscular dystrophy, Leukemia. Stem cell investigation may also allow utilize the body's own repair mechanisms to discover treatments for kidney disease. In acute kidney disease, the body can often repair kidney damage itself, on the other hand it is unable to do this well enough in chronic kidney disease. Mesenchymal-stem-cell-like cells in the kidney may open up new possibilities for enhancing the body's own ability for renewal and repair of damaged kidneys [5].

Dental Stem Cell

Stem cells can be found in most tissues of the body; they are usually hidden deep, few in number and are similar in appearance to surrounding cells. Through the discovery of stem cells in teeth, an available and available source of stem cells has been recognized [7].

The tooth is nature's stem cells; these are abundant in baby teeth, wisdom teeth and permanent teeth. The dental stem cells are capable of replicating themselves so, living stem cells found within extracted teeth; hence we can save these cells for future use in developing medical treatments [4].

Efficacy of Dental Mesenchymal Stem Cells in Kidney failure

It is very important in medical treatment using own stem cells due to lower risk of body rejection and decreases the need for drugs which may be weakened the immune system. Several medical research studies indicated that dental stem cells are the most powerful stem cells in the human body. This is due to the ability of dental stem cells to fast and longtime replicate as compared to other stem cells [1].

Dental mesenchymal stem cells are non-hematopoietic, multipotent cells which can proliferate and differentiate into various cell types. These cells characterized with: fibroblast-like morphology, ability to adhere on plastic tissue-culture surfaces, and osteogenic potency. As result of their properties, and easy isolation technique of mesenchymal stem cells, the dental mesenchymal stem cells are now become as potential, novel, important tool in treatment of difficult diseases [10].

There are various mesenchymal stem cell be present in the tooth. These are categorized according to their position in the tooth into **Fig.2.** [14]:

- Dental Pulp Stem Cells, DPSCs
- Periodontal Ligament Stem Cells, PDLSCs
- Dental Follicle Stem Cells, DFSCs
- Stem Cells from the dental Apical Papilla, SCAPs



Fig2. Mesenchymal dental stem cell

Management of Kidney Failure by Using Dental Stem Cells

There are more than 600 clinical trials conducted worldwide to date using mesenchymal dental stem cell (MSC) in treatment of various diseases. Nearly 30 clinical trials of them use MSC to treat kidney diseases. These clinical trials included 3 trials on acute kidney injury; 4 trials on chronic kidney injury; 1 trial on focal segmental glomerulosclerosis; 5 trials on autoimmune disease; and 16 trials on kidney transplantation [13].

Numerous medical researches indicated that administration of MSC has proven significant renoprotective effects including reduction of intrarenal inflammatory infiltrate, decreased fibrosis, and glomerulosclerosis [2].

CONCLUSION

Dental stem cells have several applications in various medical fields. There are various advantages for dental stem cell as compared to other stem cell types. Mesenchymal dental stem cell have significant effect in treatment of kidney diseases. Success of mesenchymal dental stem cell in treatment process open the way for using natural, available, drugs in treatment of various complicated diseases, this can be help therapists to avoid side effect of chemical therapy, and probability of organ rejection in some cases.

Conflict of Interest

The authors declare that they have no Conflict of interest.

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Citation: Walaa Fikry Elbossaty. "Efficacy of Dental Mesenchymalstem Cells in Kidney failure". *American Research Journal of Urology*; 2(1): 1-4.

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